# Characterization Data Summary
# IHSS Group 500-7


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# IHSS Group 500-7

Approval received from the Colorado Department of Public Health and Environment
( )

Approval letter contained in the Administrative Record

**March 2003**

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## ENCLOSURE

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## ACRONYMS

| | |
|---|---|
| AL | action level |
| AR | Administrative Record |
| CDPHE | Colorado Department of Public Health and Environment |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act |
| DOE | U.S. Department of Energy |
| DQA | Data Quality Assessment |
| DQO | Data Quality Objective |
| EPA | U.S. Environmental Protection Agency |
| ER | Environmental Restoration |
| ER RSOP | Environmental Restoration RFCA Standard Operating Procedure |
| HPGe | high-purity germanium detector |
| IA | Industrial Area |
| IASAP | Industrial Area Sampling and Analysis Plan |
| IHSS | Individual Hazardous Substance Site |
| K-H | Kaiser-Hill Company L.L.C. |
| MARSSIM | Multi-Agency Radiation Survey and Site Investigation Manual |
| mg/kg | milligram per kilogram |
| N/A | not applicable |
| ND | not detected |
| PAC | Potential Area of Concern |
| PARCCS | precision, accuracy, representativeness, completeness, comparability, and sensitivity |
| pCi/g | picocurie per gram |
| POC | Point of Compliance |
| RCRA | Resource Conservation and Recovery Act |
| RFCA | Rocky Flats Cleanup Agreement |
| RFETS | Rocky Flats Environmental Technology Site |
| RIN | report identification number |
| RL | reporting limit |
| SAP | Sampling and Analysis Plan |
| SD | standard deviation |
| SEP | Solar Evaporation Ponds |
| SOR | sum of ratio |
| SVOC | semi-volatile organic compound |
| ug/kg | microgram per kilogram |
| VOC | volatile organic compound |
| V&V | verification and validation |



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## 1.0 INTRODUCTION

This data summary report summarizes characterization activities conducted at Individual Hazardous Substance Site (IHSS) Group 500-7 at the Rocky Flats Environmental Technology Site (RFETS) in Golden, Colorado. Characterization activities were planned and executed in accordance with the Industrial Area Sampling and Analysis Plan (IASAP) (DOE 2001a) and IASAP Addendum #IA-02-01 (DOE 2001b).

The IHSS included in this report is listed in Table 1 and shown on Figure 1.

**Table 1**
**IHSS Group 500-7 Description**

| IHSS Group | IHSS/PAC/UBC Site |
|---|---|
| 500-7 | 500-907 – Tanker Truck Release of Hazardous Waste from Tank 231B |

## 2.0 SITE CHARACTERIZATION

IHSS Group 500-7 information consists of historical knowledge (DOE 1992-2001) and 5 sampling locations with specifications as described in IASAP Addendum #IA-02-01 (DOE 2001b). The sampling specifications for the characterization samples collected are listed in Table 2. The location of these samples and analytical results greater than background mean plus two standard deviations or reporting limits are presented in Figure 2 and Table 3. A summary of the analytical results is presented in Table 4. RFCA radionuclide sum-of-ratios (SORs) are summarized in Table 5. Deviations from planned sampling specifications are presented in Table 6. A summary of validated analytical records is presented in Table 6. The raw data are enclosed on a compact disc.

### 2.1 Analytical Results

Several analytes including PCBs, metals, and SVOCs were detected above background levels or laboratory reporting limits (RLs) at each of the five sampling locations (Figure 2). However, analytical results indicate that all concentrations are less than the RFCA Wildlife Refuge Worker (WRW) and Ecological Receptor (ER) action levels (DOE, CDPHE, EPA 2002).



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**Table 2**
**IHSS Group 500-7 Characterization Sampling Specifications**

| IHSS Group | IHSS/PAC/UBC Site | Location Code | Easting | Northing | Media | Depth Interval | Analyte | Laboratory Method |
|---|---|---|---|---|---|---|---|---|
| 500-7 | 500-907 | BZ42-001 | 2082606.49 | 749926.62 | Surface Soil | 0-0.5' | Radionuclides | HPGe |
| | | | | | | | PCBs | 8082 |
| | | | | | | | SVOCs | 8270 |
| | | | | | | | Metals | 6200/6010 |
| | | | | | | | VOCs | 8260B |
| | | BZ42-002 | 2082635.03 | 749926.81 | Surface Soil | 0-0.5' | Radionuclides | HPGe |
| | | | | | | | PCBs | 8082 |
| | | | | | | | SVOCs | 8270 |
| | | | | | | | Metals | 6200/6010 |
| | | | | | | | VOCs | 8260B |
| | | BZ42-003 | 2082635.15 | 749911.29 | Surface Soil | 0-0.5' | Radionuclides | HPGe |
| | | | | | | | PCBs | 8082 |
| | | | | | | | SVOCs | 8270 |
| | | | | | | | Metals | 6200/6010 |
| | | | | | | | VOCs | 8260B |
| | | BZ42-004 | 2082606.29 | 749911.18 | Surface Soil | 0-0.5' | Radionuclides | HPGe |
| | | | | | | | PCBs | 8082 |
| | | | | | | | SVOCs | 8270 |
| | | | | | | | Metals | 6200/6010 |
| | | | | | | | VOCs | 8260B |
| | | BZ42-005 | 2082620.83 | 749919.02 | Surface Soil | 0-0.5' | Radionuclides | HPGe |
| | | | | | | | PCBs | 8082 |
| | | | | | | | SVOCs | 8270 |
| | | | | | | | Metals | 6200/6010 |
| | | | | | | | VOCs | 8260B |

## Table 3
## Soil Results Greater than Background Mean Plus Two Standard Deviations or Reporting Limits

| Location | Easting | Northing | Analyte | Depth Start (feet) | Depth End (feet) | Result | Detection Limit | Wildlife Refuge Worker Action Level | Ecological Receptor Action Level | Background | Unit |
|---|---|---|---|---|---|---|---|---|---|---|---|
| BZ42-001 | 2082606.49 | 749926.62 | Aroclor-1260 | 0 | 0.5 | 20 | 5.3 | 12400 | - | N/A | ug/kg |
| BZ42-001 | 2082606.49 | 749926.62 | Arsenic | 0 | 0.5 | 11.2 | 25 | 22.20 | - | 10.09 | mg/kg |
| BZ42-001 | 2082606.49 | 749926.62 | Barium | 0 | 0.5 | 678 | 150 | 26400 | - | 141.26 | mg/kg |
| BZ42-001 | 2082606.49 | 749926.62 | Benzo(A)Anthracene | 0 | 0.5 | 48 | 43 | 34900 | - | N/A | ug/kg |
| BZ42-001 | 2082606.49 | 749926.62 | Chromium | 0 | 0.5 | 43.4 | 90 | 268 | - | 16.99 | mg/kg |
| BZ42-001 | 2082606.49 | 749926.62 | Chrysene | 0 | 0.5 | 94 | 59 | 3490000 | - | N/A | ug/kg |
| BZ42-001 | 2082606.49 | 749926.62 | Copper | 0 | 0.5 | 85 | 300 | 40900 | - | 18.06 | mg/kg |
| BZ42-001 | 2082606.49 | 749926.62 | Di-N-Octyl Phthalate | 0 | 0.5 | 430 | 40 | 14700000 | - | N/A | ug/kg |
| BZ42-001 | 2082606.49 | 749926.62 | Fluoranthene | 0 | 0.5 | 130 | 94 | 27200000 | - | N/A | ug/kg |
| BZ42-001 | 2082606.49 | 749926.62 | Iron | 0 | 0.5 | 42100 | 2500 | 307000 | - | 18037.00 | mg/kg |
| BZ42-001 | 2082606.49 | 749926.62 | Lead | 0 | 0.5 | 67.2 | 20 | 1000 | 97.70 | 54.62 | mg/kg |
| BZ42-001 | 2082606.49 | 749926.62 | Manganese | 0 | 0.5 | 1200 | 200 | 3480 | - | 365.08 | mg/kg |
| BZ42-001 | 2082606.49 | 749926.62 | Nickel | 0 | 0.5 | 46.9 | 60 | 20400 | - | 14.91 | mg/kg |
| BZ42-001 | 2082606.49 | 749926.62 | Pyrene | 0 | 0.5 | 110 | 45 | 22100000 | - | N/A | ug/kg |
| BZ42-001 | 2082606.49 | 749926.62 | Strontium | 0 | 0.5 | 216 | 250 | 613000 | - | 48.94 | mg/kg |
| BZ42-001 | 2082606.49 | 749926.62 | Vanadium | 0 | 0.5 | 98.5 | 100 | 7150 | 292 | 45.59 | mg/kg |
| BZ42-002 | 2082635.03 | 749926.81 | Aroclor-1260 | 0 | 0.5 | 23 | 5.1 | 12400 | - | N/A | ug/kg |
| BZ42-002 | 2082635.03 | 749926.81 | Arsenic | 0 | 0.5 | 13 | 25 | 22.20 | - | 10.09 | mg/kg |
| BZ42-002 | 2082635.03 | 749926.81 | Barium | 0 | 0.5 | 751 | 150 | 26400 | - | 141.26 | mg/kg |
| BZ42-002 | 2082635.03 | 749926.81 | Benzo(A)Anthracene | 0 | 0.5 | 91 | 42 | 34900 | - | N/A | ug/kg |
| BZ42-002 | 2082635.03 | 749926.81 | Chromium | 0 | 0.5 | 39.3 | 90 | 268 | - | 16.99 | mg/kg |
| BZ42-002 | 2082635.03 | 749926.81 | Chrysene | 0 | 0.5 | 110 | 57 | 3490000 | - | N/A | ug/kg |
| BZ42-002 | 2082635.03 | 749926.81 | Copper | 0 | 0.5 | 58.6 | 300 | 40900 | - | 18.06 | mg/kg |
| BZ42-002 | 2082635.03 | 749926.81 | Fluoranthene | 0 | 0.5 | 190 | 89 | 27200000 | - | N/A | ug/kg |
| BZ42-002 | 2082635.03 | 749926.81 | Indeno(1,2,3-Cd)Pyrene | 0 | 0.5 | 72 | 51 | 34900 | - | N/A | ug/kg |
| BZ42-002 | 2082635.03 | 749926.81 | Iron | 0 | 0.5 | 41800 | 2500 | 307000 | - | 18037.00 | mg/kg |
| BZ42-002 | 2082635.03 | 749926.81 | Lead | 0 | 0.5 | 59.8 | 20 | 1000 | 97.70 | 54.62 | mg/kg |
| BZ42-002 | 2082635.03 | 749926.81 | Manganese | 0 | 0.5 | 540 | 200 | 3480 | - | 365.08 | mg/kg |

| Location | Easting | Northing | Analyte | Depth Start (feet) | Depth End (feet) | Result | Detection Limit | Wildlife Refuge Worker Action Level | Ecological Receptor Action Level | Background | Unit |
|---|---|---|---|---|---|---|---|---|---|---|---|
| BZ42-002 | 2082635.03 | 749926.81 | Nickel | 0 | 0.5 | 48.6 | 60 | 20400 | - | 14.91 | mg/kg |
| BZ42-002 | 2082635.03 | 749926.81 | Pyrene | 0 | 0.5 | 200 | 43 | 22100000 | - | N/A | ug/kg |
| BZ42-002 | 2082635.03 | 749926.81 | Strontium | 0 | 0.5 | 216 | 250 | 613000 | - | 48.94 | mg/kg |
| BZ42-002 | 2082635.03 | 749926.81 | Vanadium | 0 | 0.5 | 90 | 100 | 7150 | 292 | 45.59 | mg/kg |
| BZ42-002 | 2082635.03 | 749926.81 | Zinc | 0 | 0.5 | 141 | 50 | 307000 | - | 73.76 | mg/kg |
| BZ42-003 | 2082635.15 | 749911.29 | Aroclor-1260 | 0 | 0.5 | 37 | 5.1 | 12400 | - | N/A | ug/kg |
| BZ42-003 | 2082635.15 | 749911.29 | Barium | 0 | 0.5 | 772 | 150 | 26400 | - | 141.26 | mg/kg |
| BZ42-003 | 2082635.15 | 749911.29 | Benzo(A)Anthracene | 0 | 0.5 | 85 | 41 | 34900 | - | N/A | ug/kg |
| BZ42-003 | 2082635.15 | 749911.29 | Chromium | 0 | 0.5 | 58.2 | 90 | 268 | - | 16.99 | mg/kg |
| BZ42-003 | 2082635.15 | 749911.29 | Chrysene | 0 | 0.5 | 120 | 56 | 3490000 | - | N/A | ug/kg |
| BZ42-003 | 2082635.15 | 749911.29 | Copper | 0 | 0.5 | 69.3 | 300 | 40900 | - | 18.06 | mg/kg |
| BZ42-003 | 2082635.15 | 749911.29 | Fluoranthene | 0 | 0.5 | 210 | 88 | 27200000 | - | N/A | ug/kg |
| BZ42-003 | 2082635.15 | 749911.29 | Indeno(1,2,3-Cd)Pyrene | 0 | 0.5 | 71 | 51 | 34900 | - | N/A | ug/kg |
| BZ42-003 | 2082635.15 | 749911.29 | Iron | 0 | 0.5 | 32000 | 2500 | 307000 | - | 18037.00 | mg/kg |
| BZ42-003 | 2082635.15 | 749911.29 | Lead | 0 | 0.5 | 61.1 | 20 | 1000 | 97.70 | 54.62 | mg/kg |
| BZ42-003 | 2082635.15 | 749911.29 | Manganese | 0 | 0.5 | 640 | 200 | 3480 | - | 365.08 | mg/kg |
| BZ42-003 | 2082635.15 | 749911.29 | Nickel | 0 | 0.5 | 33.1 | 60 | 20400 | - | 14.91 | mg/kg |
| BZ42-003 | 2082635.15 | 749911.29 | Pyrene | 0 | 0.5 | 190 | 42 | 22100000 | - | N/A | ug/kg |
| BZ42-003 | 2082635.15 | 749911.29 | Strontium | 0 | 0.5 | 221 | 250 | 613000 | - | 48.94 | mg/kg |
| BZ42-003 | 2082635.15 | 749911.29 | Vanadium | 0 | 0.5 | 74.8 | 100 | 7150 | 292 | 45.59 | mg/kg |
| BZ42-003 | 2082635.15 | 749911.29 | Zinc | 0 | 0.5 | 193 | 50 | 307000 | - | 73.76 | mg/kg |
| BZ42-004 | 2082606.29 | 749911.18 | Aroclor-1260 | 0 | 0.5 | 10 | 4.9 | 12400 | - | N/A | ug/kg |
| BZ42-004 | 2082606.29 | 749911.18 | Arsenic | 0 | 0.5 | 11.1 | 25 | 22.20 | - | 10.09 | mg/kg |
| BZ42-004 | 2082606.29 | 749911.18 | Barium | 0 | 0.5 | 719 | 150 | 26400 | - | 141.26 | mg/kg |
| BZ42-004 | 2082606.29 | 749911.18 | Benzo(A)Anthracene | 0 | 0.5 | 48 | 40 | 34900 | - | N/A | ug/kg |
| BZ42-004 | 2082606.29 | 749911.18 | Chromium | 0 | 0.5 | 43.1 | 90 | 268 | - | 16.99 | mg/kg |
| BZ42-004 | 2082606.29 | 749911.18 | Chrysene | 0 | 0.5 | 62 | 55 | 3490000 | - | N/A | ug/kg |
| BZ42-004 | 2082606.29 | 749911.18 | Copper | 0 | 0.5 | 68.3 | 300 | 40900 | - | 18.06 | mg/kg |
| BZ42-004 | 2082606.29 | 749911.18 | Fluoranthene | 0 | 0.5 | 92 | 86 | 27200000 | - | N/A | ug/kg |
| BZ42-004 | 2082606.29 | 749911.18 | Iron | 0 | 0.5 | 34200 | 2500 | 307000 | - | 18037.00 | mg/kg |

| Location | Easting | Northing | Analyte | Depth Start (feet) | Depth End (feet) | Result | Detection Limit | Wildlife Refuge Worker Action Level | Ecological Receptor Action Level | Background | Unit |
|---|---|---|---|---|---|---|---|---|---|---|---|
| BZ42-004 | 2082606.29 | 749911.18 | Manganese | 0 | 0.5 | 720 | 200 | 3480 | - | 365.08 | mg/kg |
| BZ42-004 | 2082606.29 | 749911.18 | Nickel | 0 | 0.5 | 35.5 | 60 | 20400 | - | 14.91 | mg/kg |
| BZ42-004 | 2082606.29 | 749911.18 | Pyrene | 0 | 0.5 | 94 | 41 | 22100000 | - | N/A | ug/kg |
| BZ42-004 | 2082606.29 | 749911.18 | Strontium | 0 | 0.5 | 241 | 250 | 613000 | - | 48.94 | mg/kg |
| BZ42-004 | 2082606.29 | 749911.18 | Vanadium | 0 | 0.5 | 86.3 | 100 | 7150 | 292 | 45.59 | mg/kg |
| BZ42-004 | 2082606.29 | 749911.18 | Zinc | 0 | 0.5 | 230 | 50 | 307000 | - | 73.76 | mg/kg |
| BZ42-005 | 2082620.83 | 749919.02 | Acetone | 0 | 0.5 | 6.3 | 100 | 102000000 | 211000 | N/A | ug/kg |
| BZ42-005 | 2082620.83 | 749919.02 | Aroclor-1260 | 0 | 0.5 | 10 | 4.9 | 12400 | - | N/A | ug/kg |
| BZ42-005 | 2082620.83 | 749919.02 | Barium | 0 | 0.5 | 762 | 150 | 26400 | - | 141.26 | mg/kg |
| BZ42-005 | 2082620.83 | 749919.02 | Chromium | 0 | 0.5 | 36 | 90 | 268 | - | 16.99 | mg/kg |
| BZ42-005 | 2082620.83 | 749919.02 | Copper | 0 | 0.5 | 73.4 | 300 | 40900 | - | 18.06 | mg/kg |
| BZ42-005 | 2082620.83 | 749919.02 | Iron | 0 | 0.5 | 29100 | 2500 | 307000 | - | 18037.00 | mg/kg |
| BZ42-005 | 2082620.83 | 749919.02 | Manganese | 0 | 0.5 | 490 | 200 | 3480 | - | 365.08 | mg/kg |
| BZ42-005 | 2082620.83 | 749919.02 | Nickel | 0 | 0.5 | 32.5 | 60 | 20400 | - | 14.91 | mg/kg |
| BZ42-005 | 2082620.83 | 749919.02 | Strontium | 0 | 0.5 | 224 | 250 | 613000 | - | 48.94 | mg/kg |
| BZ42-005 | 2082620.83 | 749919.02 | Vanadium | 0 | 0.5 | 59.6 | 100 | 7150 | 292 | 45.59 | mg/kg |
| BZ42-005 | 2082620.83 | 749919.02 | Zinc | 0 | 0.5 | 120 | 50 | 307000 | - | 73.76 | mg/kg |

N/A – Not applicable.

## Table 4
## IHSS Group 500-7 Summary of Analytical Results

| Media | Analyte | Number Samples | Detection Frequency | Maximum | Mean | Wildlife Refuge Worker Action Level | Ecological Receptor Action Level | Background | Unit |
|---|---|---|---|---|---|---|---|---|---|
| Surface Soil | Arsenic | 5 | 100% | 13.00 | 9.98 | 22.20 | - | 10.09 | mg/kg |
| Surface Soil | Chromium | 5 | 100% | 58.20 | 44.00 | 268 | - | 16.99 | mg/kg |
| Surface Soil | Antimony | 5 | 0% | 3.50 | 3.50 | 409 | - | N/A | mg/kg |
| Surface Soil | Cadmium | 5 | 0% | 1.50 | 1.50 | 962 | - | 1.61 | mg/kg |
| Surface Soil | Lead | 5 | 100% | 67.20 | 53.90 | 1000 | 97.70 | 54.62 | mg/kg |
| Surface Soil | Cobalt | 5 | 0% | 45.00 | 45.00 | 1550 | - | 10.91 | mg/kg |
| Surface Soil | Manganese | 5 | 100% | 1200.00 | 718.00 | 3480 | - | 365.08 | mg/kg |
| Surface Soil | Molybdenum | 5 | 0% | 25.00 | 25.00 | 5110 | - | N/A | mg/kg |
| Surface Soil | Selenium | 5 | 0% | 0.50 | 0.50 | 5110 | - | 1.22 | mg/kg |
| Surface Soil | Silver | 5 | 0% | 2.50 | 2.50 | 5110 | - | N/A | mg/kg |
| Surface Soil | Vanadium | 5 | 100% | 98.50 | 81.84 | 7150 | 292 | 45.59 | mg/kg |
| Surface Soil | Nickel | 5 | 100% | 48.60 | 39.32 | 20400 | - | 14.91 | mg/kg |
| Surface Soil | Barium | 5 | 100% | 772.00 | 736.40 | 26400 | - | 141.26 | mg/kg |
| Surface Soil | Copper | 5 | 100% | 85.00 | 70.92 | 40900 | - | 18.06 | mg/kg |
| Surface Soil | Iron | 5 | 100% | 42100.00 | 35840.00 | 307000 | - | 18037.00 | mg/kg |
| Surface Soil | Zinc | 5 | 80% | 230.00 | 137.70 | 307000 | - | 73.76 | mg/kg |
| Surface Soil | Strontium | 5 | 100% | 241.00 | 223.60 | 613000 | - | 48.94 | mg/kg |
| Surface Soil | Tin | 5 | 20% | 5.27 | 2.65 | 613000 | - | N/A | mg/kg |
| Surface Soil | Uranium-235 | 5 | 0% | 0.39 | 0.22 | 8 | - | 0.09 | pCi/g |
| Surface Soil | Americium-241 | 5 | 0% | 2.22 | 2.22 | 76 | - | 0.02 | pCi/g |
| Surface Soil | Uranium-238/-234 | 5 | 0% | 5.70 | 4.30 | 351 | - | 2.00 | pCi/g |
| Surface Soil | Benzo(A)Pyrene | 5 | 0% | 185.00 | 175.00 | 3490 | - | N/A | ug/kg |
| Surface Soil | Dibenz(A,H)Anthracene | 5 | 0% | 185.00 | 175.00 | 3490 | - | N/A | ug/kg |
| Surface Soil | N-Nitroso-Di-N-Propylamine | 5 | 0% | 185.00 | 175.00 | 5470 | - | N/A | ug/kg |
| Surface Soil | Aroclor-1221 | 5 | 0% | 18.50 | 17.50 | 12400 | - | N/A | ug/kg |
| Surface Soil | Aroclor-1232 | 5 | 0% | 18.50 | 17.50 | 12400 | - | N/A | ug/kg |
| Surface Soil | Aroclor-1242 | 5 | 0% | 18.50 | 17.50 | 12400 | - | N/A | ug/kg |
| Surface Soil | Aroclor-1248 | 5 | 0% | 18.50 | 17.50 | 12400 | - | N/A | ug/kg |

| Media | Analyte | Number Samples | Detection Frequency | Maximum | Mean | Wildlife Refuge Worker Action Level | Ecological Receptor Action Level | Background | Unit |
|---|---|---|---|---|---|---|---|---|---|
| Surface Soil | Aroclor-1254 | 5 | 0% | 18.50 | 17.50 | 12400 | - | N/A | ug/kg |
| Surface Soil | Aroclor-1260 | 5 | 100% | 37.00 | 20.00 | 12400 | - | N/A | ug/kg |
| Surface Soil | 1,1-Dichloroethene | 4 | 0% | 0.96 | 0.92 | 17000 | - | N/A | ug/kg |
| Surface Soil | Hexachlorobenzene | 5 | 0% | 185.00 | 175.00 | 17200 | - | N/A | ug/kg |
| Surface Soil | Chloroform | 4 | 0% | 0.33 | 0.32 | 19200 | - | N/A | ug/kg |
| Surface Soil | Trichloroethene | 4 | 0% | 0.43 | 0.41 | 19600 | - | N/A | ug/kg |
| Surface Soil | Bis(2-Chloroethyl) Ether | 5 | 0% | 185.00 | 175.00 | 34800 | - | N/A | ug/kg |
| Surface Soil | Benzo(A)Anthracene | 5 | 80% | 170.00 | 88.40 | 34900 | - | N/A | ug/kg |
| Surface Soil | Benzo(B)Fluoranthene | 5 | 0% | 185.00 | 175.00 | 34900 | - | N/A | ug/kg |
| Surface Soil | Indeno(1,2,3-Cd)Pyrene | 5 | 40% | 185.00 | 133.60 | 34900 | - | N/A | ug/kg |
| Surface Soil | Vinyl Chloride | 4 | 0% | 1.29 | 1.24 | 41200 | 431 | N/A | ug/kg |
| Surface Soil | Aroclor-1016 | 5 | 0% | 18.50 | 17.50 | 46400 | - | N/A | ug/kg |
| Surface Soil | 2,4-Dinitrotoluene | 5 | 0% | 185.00 | 175.00 | 56300 | - | N/A | ug/kg |
| Surface Soil | 2,6-Dinitrotoluene | 5 | 0% | 185.00 | 175.00 | 56300 | - | N/A | ug/kg |
| Surface Soil | 3,3'-Dichlorobenzidine | 5 | 0% | 700.00 | 680.00 | 61300 | - | N/A | ug/kg |
| Surface Soil | Carbon Tetrachloride | 4 | 0% | 0.35 | 0.33 | 81500 | - | N/A | ug/kg |
| Surface Soil | 1,1,2,2-Tetrachloroethane | 4 | 0% | 0.37 | 0.35 | 100000 | - | N/A | ug/kg |
| Surface Soil | 1,2-Dichloroethane | 4 | 0% | 0.56 | 0.54 | 106000 | - | N/A | ug/kg |
| Surface Soil | Hexachlorobutadiene | 9 | 0% | 185.00 | 97.34 | 147000 | - | N/A | ug/kg |
| Surface Soil | Pentachlorophenol | 5 | 0% | 900.00 | 840.00 | 162000 | - | N/A | ug/kg |
| Surface Soil | Bromomethane | 4 | 0% | 1.69 | 1.63 | 193000 | - | N/A | ug/kg |
| Surface Soil | Benzene | 4 | 0% | 0.38 | 0.37 | 205000 | - | N/A | ug/kg |
| Surface Soil | 1,1,2-Trichloroethane | 4 | 0% | 0.45 | 0.43 | 236000 | - | N/A | ug/kg |
| Surface Soil | Cis-1,3-Dichloropropene | 4 | 0% | 0.32 | 0.31 | 250000 | - | N/A | ug/kg |
| Surface Soil | Trans-1,3-Dichloropropene | 4 | 0% | 0.45 | 0.43 | 250000 | - | N/A | ug/kg |
| Surface Soil | Dibromochloromethane | 4 | 0% | 0.47 | 0.45 | 329000 | - | N/A | ug/kg |
| Surface Soil | Nitrobenzene | 5 | 0% | 185.00 | 175.00 | 332000 | - | N/A | ug/kg |
| Surface Soil | 1,2-Dichloropropane | 4 | 0% | 0.23 | 0.22 | 345000 | - | N/A | ug/kg |
| Surface Soil | Benzo(K)Fluoranthene | 5 | 0% | 185.00 | 175.00 | 349000 | - | N/A | ug/kg |
| Surface Soil | Chloromethane | 4 | 0% | 1.20 | 1.16 | 371000 | - | N/A | ug/kg |

| Media | Analyte | Number Samples | Detection Frequency | Maximum | Mean | Wildlife Refuge Worker Action Level | Ecological Receptor Action Level | Background | Unit |
|---|---|---|---|---|---|---|---|---|---|
| Surface Soil | 2,2'-Oxybis(1-Chloropropane) | 5 | 0% | 185.00 | 175.00 | 547000 | - | N/A | ug/kg |
| Surface Soil | Tetrachloroethene | 4 | 0% | 0.64 | 0.62 | 615000 | - | N/A | ug/kg |
| Surface Soil | Bromodichloromethane | 4 | 0% | 0.33 | 0.31 | 617000 | - | N/A | ug/kg |
| Surface Soil | Hexachloroethane | 5 | 0% | 185.00 | 175.00 | 737000 | - | N/A | ug/kg |
| Surface Soil | 1,4-Dichlorobenzene | 4 | 0% | 0.36 | 0.35 | 840000 | - | N/A | ug/kg |
| Surface Soil | P-Dichlorobenzene | 5 | 0% | 185.00 | 175.00 | 840000 | - | N/A | ug/kg |
| Surface Soil | 4,6-Dinitro-O-Cresol | 5 | 0% | 900.00 | 840.00 | 1020000 | - | N/A | ug/kg |
| Surface Soil | Bis(2-Ethylhexyl)Phthalate | 5 | 0% | 185.00 | 175.00 | 1970000 | - | N/A | ug/kg |
| Surface Soil | 2,4-Dinitrophenol | 5 | 0% | 900.00 | 840.00 | 2040000 | - | N/A | ug/kg |
| Surface Soil | Methylene Chloride | 4 | 0% | 0.45 | 0.44 | 2530000 | 39500 | N/A | ug/kg |
| Surface Soil | 4-Chloroaniline | 5 | 0% | 185.00 | 175.00 | 2950000 | - | N/A | ug/kg |
| Surface Soil | Dibenzofuran | 5 | 0% | 185.00 | 175.00 | 2950000 | - | N/A | ug/kg |
| Surface Soil | 2,4-Dichlorophenol | 5 | 0% | 185.00 | 175.00 | 3070000 | - | N/A | ug/kg |
| Surface Soil | Naphthalene | 9 | 0% | 185.00 | 97.47 | 3090000 | - | N/A | ug/kg |
| Surface Soil | 2,4,6-Trichlorophenol | 5 | 0% | 185.00 | 175.00 | 3470000 | - | N/A | ug/kg |
| Surface Soil | Chrysene | 5 | 80% | 170.00 | 111.20 | 3490000 | - | N/A | ug/kg |
| Surface Soil | Hexachlorocyclopentadiene | 5 | 0% | 370.00 | 349.00 | 3500000 | - | N/A | ug/kg |
| Surface Soil | 4-Methylphenol | 5 | 0% | 185.00 | 175.00 | 3690000 | - | N/A | ug/kg |
| Surface Soil | Bromoform | 4 | 0% | 0.71 | 0.68 | 3730000 | - | N/A | ug/kg |
| Surface Soil | Ethylbenzene | 4 | 0% | 0.35 | 0.33 | 4250000 | - | N/A | ug/kg |
| Surface Soil | 2-Chlorophenol | 5 | 0% | 185.00 | 175.00 | 5110000 | - | N/A | ug/kg |
| Surface Soil | Chlorobenzene | 4 | 0% | 0.27 | 0.26 | 6090000 | - | N/A | ug/kg |
| Surface Soil | N-Nitrosodiphenylamine | 5 | 0% | 185.00 | 175.00 | 7810000 | - | N/A | ug/kg |
| Surface Soil | P-Nitrophenol | 5 | 0% | 900.00 | 840.00 | 8180000 | - | N/A | ug/kg |
| Surface Soil | 1,2,4-Trichlorobenzene | 9 | 0% | 185.00 | 97.37 | 9230000 | - | N/A | ug/kg |
| Surface Soil | Chloroethane | 4 | 0% | 1.05 | 1.01 | 13200000 | - | N/A | ug/kg |
| Surface Soil | Di-N-Octyl Phthalate | 5 | 20% | 430.00 | 224.00 | 14700000 | - | N/A | ug/kg |
| Surface Soil | Carbon Disulfide | 4 | 0% | 0.30 | 0.29 | 15100000 | - | N/A | ug/kg |
| Surface Soil | 4-Methyl-2-Pentanone | 4 | 0% | 3.62 | 3.48 | 16400000 | - | N/A | ug/kg |
| Surface Soil | 2-Nitroaniline | 5 | 0% | 900.00 | 840.00 | 16700000 | - | N/A | ug/kg |

| Media | Analyte | Number Samples | Detection Frequency | Maximum | Mean | Wildlife Refuge Worker Action Level | Ecological Receptor Action Level | Background | Unit |
|---|---|---|---|---|---|---|---|---|---|
| Surface Soil | 2,4-Dimethylphenol | 5 | 0% | 185.00 | 175.00 | 20400000 | - | N/A | ug/kg |
| Surface Soil | 2-Methylnaphthalene | 5 | 0% | 185.00 | 175.00 | 20400000 | - | N/A | ug/kg |
| Surface Soil | Pyrene | 5 | 80% | 200.00 | 152.80 | 22100000 | - | N/A | ug/kg |
| Surface Soil | 1,1-Dichloroethane | 4 | 0% | 0.39 | 0.38 | 22500000 | - | N/A | ug/kg |
| Surface Soil | Fluoranthene | 5 | 80% | 210.00 | 158.40 | 27200000 | - | N/A | ug/kg |
| Surface Soil | Isophorone | 5 | 0% | 185.00 | 175.00 | 29100000 | - | N/A | ug/kg |
| Surface Soil | 1,2-Dichlorobenzene | 9 | 0% | 185.00 | 97.36 | 31200000 | - | N/A | ug/kg |
| Surface Soil | Toluene | 4 | 0% | 0.30 | 0.29 | 31300000 | 329000 | N/A | ug/kg |
| Surface Soil | 2-Methylphenol | 5 | 0% | 185.00 | 175.00 | 36900000 | - | N/A | ug/kg |
| Surface Soil | Acenaphthene | 5 | 0% | 185.00 | 175.00 | 40800000 | - | N/A | ug/kg |
| Surface Soil | Fluorene | 5 | 0% | 185.00 | 175.00 | 40800000 | - | N/A | ug/kg |
| Surface Soil | Di-N-Butyl Phthalate | 5 | 0% | 185.00 | 175.00 | 73700000 | - | N/A | ug/kg |
| Surface Soil | 1,1,1-Trichloroethane | 4 | 0% | 0.41 | 0.39 | 79700000 | - | N/A | ug/kg |
| Surface Soil | 2-Chloronaphthalene | 5 | 0% | 185.00 | 175.00 | 81800000 | - | N/A | ug/kg |
| Surface Soil | 2,4,5-Trichlorophenol | 5 | 0% | 185.00 | 175.00 | 102000000 | - | N/A | ug/kg |
| Surface Soil | Acetone | 4 | 25% | 6.30 | 2.80 | 102000000 | 211000 | N/A | ug/kg |
| Surface Soil | Styrene | 4 | 0% | 0.41 | 0.39 | 123000000 | - | N/A | ug/kg |
| Surface Soil | Butylbenzylphthalate | 5 | 0% | 185.00 | 175.00 | 147000000 | - | N/A | ug/kg |
| Surface Soil | 2-Butanone | 4 | 0% | 3.29 | 3.17 | 192000000 | 433000 | N/A | ug/kg |
| Surface Soil | Anthracene | 5 | 0% | 185.00 | 175.00 | 204000000 | - | N/A | ug/kg |
| Surface Soil | Benyzl Alcohol | 5 | 0% | 185.00 | 175.00 | 307000000 | - | N/A | ug/kg |
| Surface Soil | Diethyl Phthalate | 5 | 0% | 370.00 | 349.00 | 590000000 | - | N/A | ug/kg |
| Surface Soil | Phenol | 5 | 0% | 185.00 | 175.00 | 613000000 | - | N/A | ug/kg |
| Surface Soil | Benzoic Acid | 5 | 0% | 900.00 | 840.00 | 1000000000 | - | N/A | ug/kg |
| Surface Soil | Dimethyl Phthalate | 5 | 0% | 185.00 | 175.00 | 1000000000 | - | N/A | ug/kg |
| Surface Soil | Xylenes (Total) | 4 | 0% | 1.39 | 1.34 | 1000000000 | - | N/A | ug/kg |

N/A – Not applicable.

## 2.2 Sum of Ratios

RFCA SORs were calculated for the IHSS Group 500-7 sample locations. SOR calculations were based on accelerated action analytical data for the radionuclides of concern (i.e., americium-241, plutonium-239/240, uranium-234, uranium-235, and uranium-238). None of the radionuclide activities were greater than background (mean plus two standard deviations) or reporting limits. Therefore, the radionuclide SOR value at each sampling location was less than the threshold value of 1.

# 3.0 DEVIATIONS FROM PLANNED SAMPLING SPECIFICATIONS

There were no deviations from the planned sampling specifications described in IASAP Addendum #IA-02-01 (DOE 2002a) as presented in the following table.

**Table 5**
**IHSS Group 500-7 Deviations from Planned Sampling Specifications**

| Location Code | Planned Easting | Planned Northing | Actual Easting | Actual Northing | Comments |
|---|---|---|---|---|---|
| BZ42-001 | 2082606.49 | 749926.62 | 2082606.49 | 749926.62 | No Deviations Between the Planned and Actual Scenarios |
| BZ42-002 | 2082635.03 | 749926.81 | 2082635.03 | 749926.81 | |
| BZ42-003 | 2082635.15 | 749911.29 | 2082635.15 | 749911.29 | |
| BZ42-004 | 2082606.29 | 749911.18 | 2082606.29 | 749911.18 | |
| BZ42-005 | 2082620.83 | 749919.02 | 2082620.83 | 749919.02 | |

# 4.0 SOIL RISK SCREEN

This soil risk screen follows the steps as shown in Figure 3 from the proposed RFCA Attachment 5 modifications (DOE, CDPHE, EPA 2002).

**Screen 1** – Are the COC concentrations below RFCA Table 3 Action Levels for the WRW?

Yes. Analytical results indicate that concentrations of soil contaminants are present at concentrations less than the WRW ALs (DOE, CDPHE, EPA 2002). Hence go to Screen 5.

**Screen 5** – Are COC concentrations below Table 3 Soil Action Levels for ecological receptors?

Yes. All COC concentrations are below the ALs for ecological receptors

**Screen 6** - Is there a potential to exceed Surface Water Standards at a POC?

No. COC concentrations are below the WRW ALs.

**Summary**

Analytical results and the above soil risk screen indicate that No Further Accelerated Action (NFAA) is required at IHSS Group 500-7. Approval of this Data Summary Report constitutes regulatory agency concurrence that this IHSS Group is an NFAA. This information and NFAA determination will be documented in the FY03 Historical Release Report (HRR).

## 5.0 DATA QUALITY ASSESSMENT (DQA)

This section presents a Data Quality Assessment (DQA) of the analytical results from samples collected at IHSS Group 500-7, August, 2002. The DQA is based on various criteria derived from EPA Guidance, particularly the DQO process, DOE quality requirements, and site-specific protocols; references are given in the last subsection of this DQA. The DQA is performed independently of data reduction and evaluation given throughout the remainder of this report. QC evaluations performed on the IA Group 500-7 data set are documented within the MS ACCESS database "PlanvsActuals2.mdb".

### *DQO Decisions*

Consistent with original DQO decision rules of the project, a radionuclide SOR calculation was performed on each soil sample acquired from the 500-7 area. All non-radionuclide concentrations are less than the RFCA Wildlife Refuge Worker (WWR) and Ecological Receptor (ER) action levels (RFCA draft rev. 10, ALF Table 3). In addition, the radionuclide SOR value at each of the five sampling locations was less than the threshold value of 1. Therefore, no remediation is required (with acceptance of qualifications given in this section).

Use of EPA QA/G-4, lognormal, or non-parametric methods, such as the Sign Test in MARSSIM (EPA et al., 1997) would yield better than a 95% confidence that enough samples were acquired to conclude that each analyte is below its respective RFCA action level.

### *Verification and Validation of Results*

Verification ensures that data produced and used by the project are documented and traceable per quality requirements. Validation consists of a technical review of analytical results such that any limitations relative to project decisions are stated. V&V criteria include:

- Chain-of-Custody;
- Preservation and hold-times;
- Precision & Accuracy;
- Instrument Calibrations;
- Preparation Blanks;



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- Interference Check Samples (metals);
- Matrix Spikes/Matrix Spike Duplicates (MS/MSD);
- Lab Control Samples (LCS);
- Field Duplicate measurements;
- Chemical yield (radiochemistry);
- Required Detection Limits/Minimum Detectable Activities (sensitivity of chemical and radiochemical measurements, respectively); and,
- Sample Analysis and Preparation methods.

Evaluation of V&V criteria ensures that PARCCS (precision, accuracy, representativeness, completeness, comparability, and sensitivity) parameters are satisfactory, i.e., within tolerances acceptable to the project. Satisfactory V&V of laboratory quality controls are captured through application of validation "flags", or qualifiers, to individual records. V&V results are summarized in Table 7.

**Table 6. IA Group 500-7**

| | | Metals | PCBs | SVOCs | pH | Rads |
|---|---|---|---|---|---|---|
| VAL_QUAL_CODE | Total Of CAS_NO | SW6010 | SW8082 | SW8270B | SW9040 | Gamma Spec |
| 1 | 87 | | 14 | 53 | 2 | 18 |
| J1 | 6 | 6 | | | | |
| V1 | 523 | 25 | 49 | 449 | | |
| UJ1 | 13 | | | 13 | | |
| R1 | 7 | | | | 7 | |
| | | | | | | |
| Total | 636 | 31 | 63 | 515 | 9 | 18 |
| | | | | | | |
| % Verified/Validated | 100% | 100% | 100% | 100% | 100% | 100% |
| % Rejected | 1% | 0% | 0% | 0% | 78% | 0% |
| | | | | | | |

Field sampling was conducted according to the approved IASAP, including related SOPs and addenda. Raw hardcopy data, e.g., individual (analytical) data packages, are currently filed by RIN and maintained by KH ASD; older hardcopies representing "legacy" data reside in the Federal Center (Lakewood, CO, NARA). Digital data are stored on the RADMS server (RFETS intranet, MS ACCESS-based) and the RFETS Soil and Water Database (SWD, Oracle-based).

***Precision and Accuracy***

Precision and accuracy of laboratory results are captured in the V&V process. Precision and accuracy of all results are satisfactory, based on validation frequencies and results given in Table 7.

Overall precision of the field sampling is adequate based on repeatability of 1 duplicate/real sample pair, where all results are below applicable RFCA action levels (or

reporting limits, where no action level exists for the analyte of interest) – with one exception: phenanthrene was detected at 68 ppb in real sample 02E0195-001, whereas it was not detected in the field duplicate 02E0195-009. Frequency of duplicate collection is >5% (> 1duplicate per 20 reals), consistent with DQOs of the project.

Field blanks collected during the project indicate no false positives in the data set due to cross-contamination.

***Representativeness***

Samples acquired for the project are representative of the 500-7 area based on the types, number, and location of samples acquired relative to the site-specific history (DOE, 2001). Other criteria that corroborate representativeness include:

1. Implementation of industry-standard Chain-of-Custody protocols;

2. Compliance with sample preservation and hold times; and,

3. Compliance with documented and Site-approved sampling plans and procedures, including SW-846 analytical methods.

Maps and tables of sample locations are displayed in previous sections of this report.

***Completeness***

Sampling completeness is evaluated through an inventory of the number and types of samples acquired for the IA Group 500-7 area of interest. Specifically, were enough samples collected, and valid results produced, to make project decisions?

The following number of real soil samples were collected at 5 unique locations:

| | |
|---|---|
| Metals (SW6200, XRF): 5 | SVOCs: 6 |
| VOCs: 5 | PCBs: 6 |
| pH: 6 | Rads (Gamma Spec): 6 |

Beryllium and lithium were not included in the metals suite in surface soils (SW6200, XRF) and therefore, were not compared to RFCA Action Levels. However this should not affect the remedial decisions because beryllium and lithium were not associated with the D- and F-Listed waste that was released to the environment in 1994 (DOE, 1992-2001). Therefore these metals are not regarded as PCOCs for this IHSS Group. All soil pH results were rejected, thus completeness for pH is unacceptable (at 12%). Additional pH samples are not warranted because the re-sampling results would not impact the decisions regarding remediation or NFAA. The conclusions derived from this *Data Summary Report* would not be affected regardless of the pH results because there are no corresponding RFCA ALs for pH. Radionuclides were determined through gamma spectroscopy, where $^{239/240}$Pu and $^{233/234}$U are inferred from $^{241}$Am and $^{238}$U, respectively.

Satisfactory V&V are indicated by a 25% (or greater) validation frequency of all results by method, with <10% rejection of those records validated. Table 7 indicates that validation and rejection frequencies are acceptable for all listed analytical suites, and that all results are usable without qualification (except for the previously discussed pH results).

***Comparability***

All results presented are comparable with nation-wide CERCLA data and DOE complex-wide environmental data. This comparability is based on:

1. Use of standardized engineering units in the reporting of measurement results;
2. Consistent sensitivities of measurements (generally ≤ ½ corresponding action levels); and,
3. Use of site-approved procedures, work plans, and quality controls (e.g., Contractual Statements of Work for lab analyses; DOE/KH, 2002).

***Sensitivity***

Reporting limits, in units of ug/kg (ppb) were compared with RFCA action levels on a record-by-record basis. Adequate sensitivities of analytical methods were attained for all results except arsenic; however, arsenic concentrations were estimated at levels below the action level of 22 ppm. "Adequate" sensitivity is defined as an RL less than the analyte's associated action level, ideally <1/2 the action level.

***Summary***

Data quality is acceptable for project decisions based on the V&V criteria cited and with the qualifications given.

## 6.0 REFERENCES

DOE, 1992-2001, Historical Release Reports for the Rocky Flats Plant, Rocky Flats Plant, Golden, Colorado, June.

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EPA QA/G-9, 1998, Guidance for the Data Quality Assessment Process; Practical Methods for Data Analysis.

Kaiser-Hill (K-H), 1997a, General Guidelines for Data Verification and Validation, DAGR01-v1, December.

K-H, 1997b, V&V Guidelines for Volatile Organics, DA-SS01-v1, December.

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K-H, 1997d, V&V Guidelines for Metals, DA-SS05-v1, December.

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Lockheed-Martin, 1997, Evaluation of Radiochemical Data Usability, ES/ER/MS-5.



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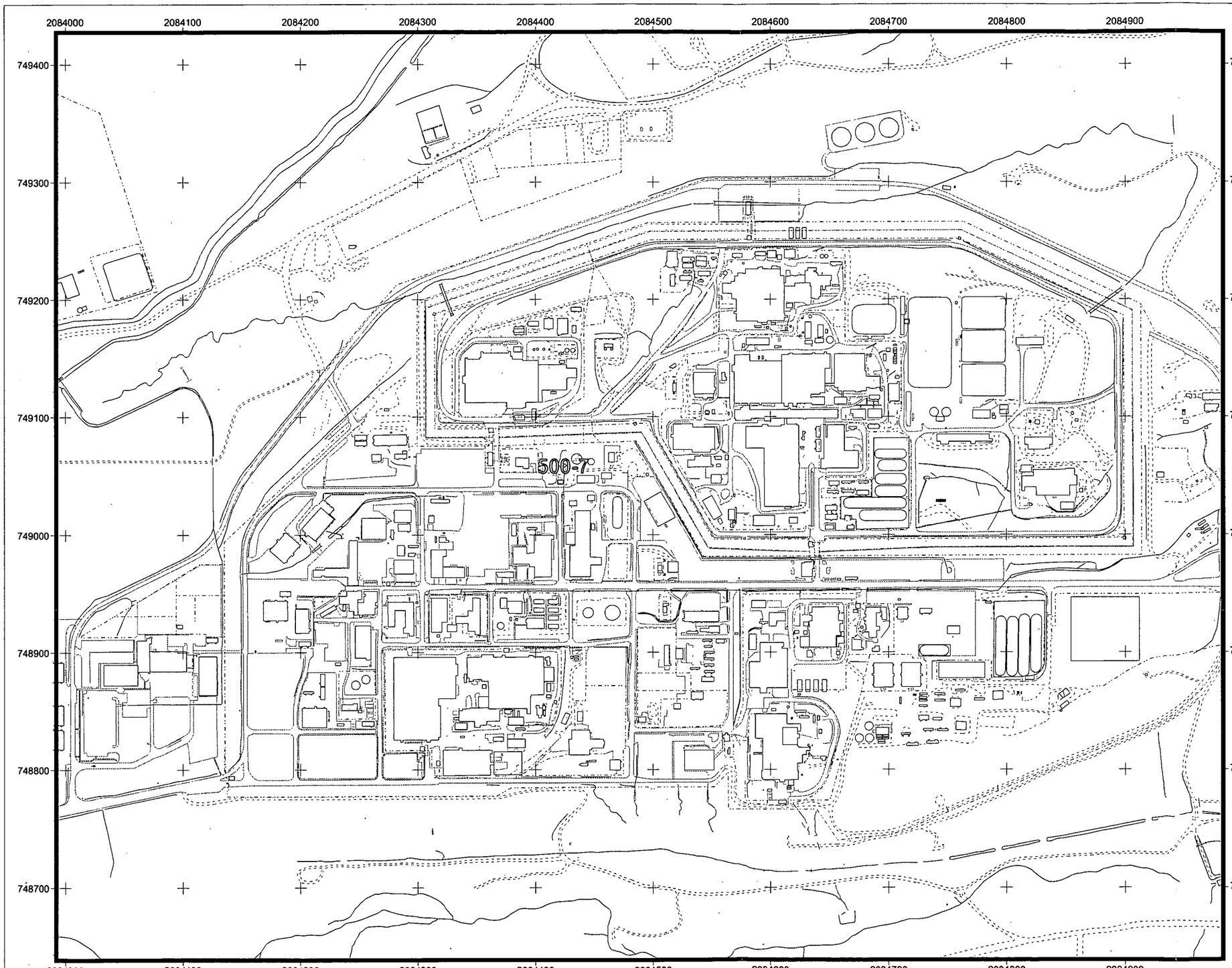
# Figure 1
# IHSS Group 500-7
# Location Map




**Key**

- IHSS Group 500-7
- Buildings
- Dirt Roads
- Paved areas
- Surface Water Feature



N

Scale = 1:8500

40 0 40 80 Feet

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

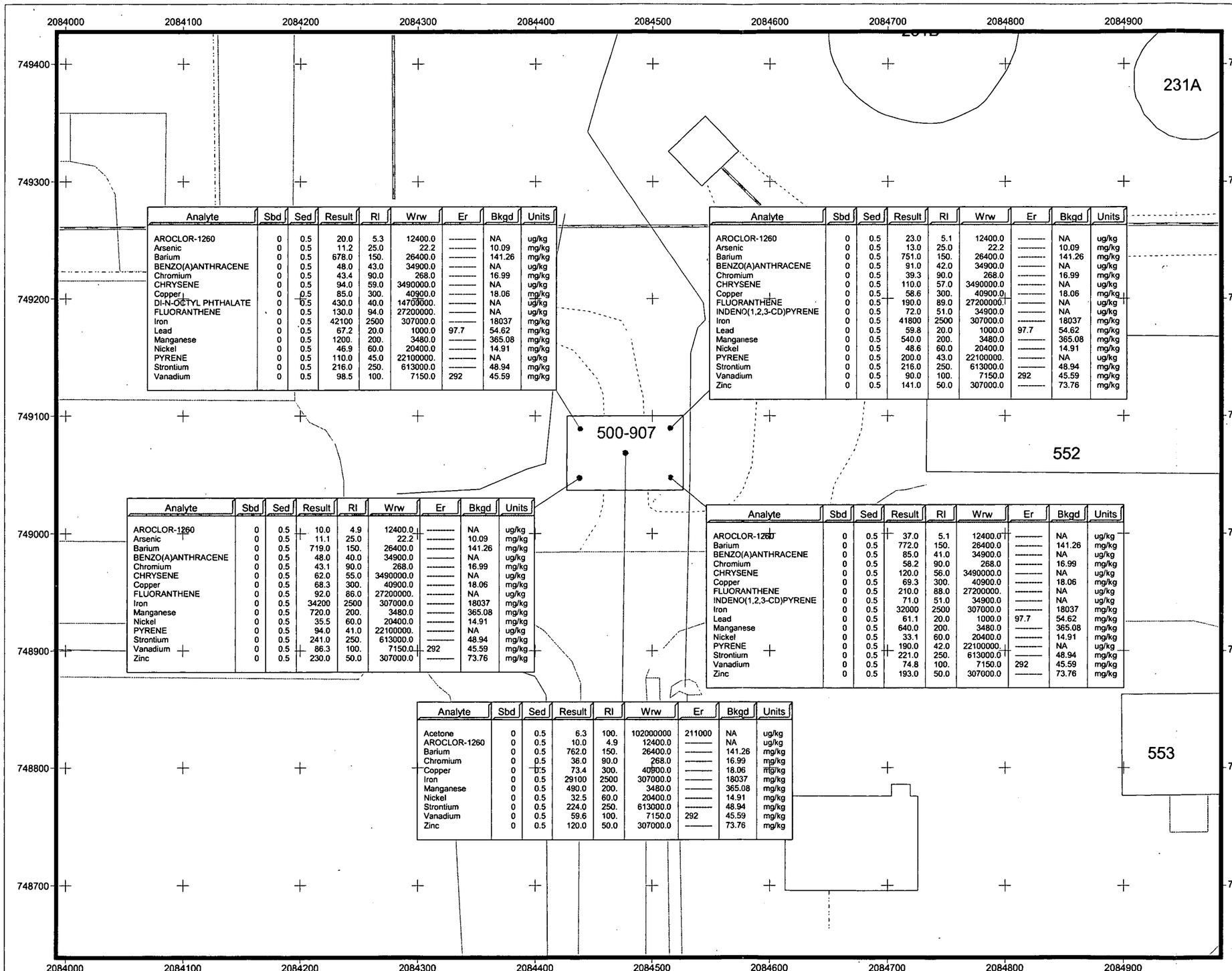
U.S. Department of Energy
Rocky Flats Environmental Technology Site

Prepared by: RADMS

Date: 2.13.03

KAISER•HILL COMPANY

File: W:\Projects\Fy2003\500-7\500-7_char_jb.apr




| Analyte | Sbd | Sed | Result | RI | Wrw | Er | Bkgd | Units |
|---|---|---|---|---|---|---|---|---|
| AROCLOR-1260 | 0 | 0.5 | 20.0 | 5.3 | 12400.0 | ——— | NA | ug/kg |
| Arsenic | 0 | 0.5 | 11.2 | 25.0 | 22.2 | ——— | 10.09 | mg/kg |
| Barium | 0 | 0.5 | 678.0 | 150. | 26400.0 | ——— | 141.26 | mg/kg |
| BENZO(A)ANTHRACENE | 0 | 0.5 | 48.0 | 43.0 | 34900.0 | ——— | NA | ug/kg |
| Chromium | 0 | 0.5 | 43.4 | 90.0 | 268.0 | ——— | 16.99 | mg/kg |
| CHRYSENE | 0 | 0.5 | 94.0 | 59.0 | 3490000.0 | ——— | NA | ug/kg |
| Copper | 0 | 0.5 | 85.0 | 300. | 40900.0 | ——— | 18.06 | mg/kg |
| DI-N-OCTYL PHTHALATE | 0 | 0.5 | 430.0 | 40.0 | 14700000. | ——— | NA | ug/kg |
| FLUORANTHENE | 0 | 0.5 | 130.0 | 94.0 | 27200000. | ——— | NA | ug/kg |
| Iron | 0 | 0.5 | 42100 | 2500 | 307000.0 | ——— | 18037 | mg/kg |
| Lead | 0 | 0.5 | 67.2 | 20.0 | 1000.0 | 97.7 | 54.62 | mg/kg |
| Manganese | 0 | 0.5 | 1200. | 200. | 3480.0 | ——— | 365.08 | mg/kg |
| Nickel | 0 | 0.5 | 46.9 | 60.0 | 20400.0 | ——— | 14.91 | mg/kg |
| PYRENE | 0 | 0.5 | 110.0 | 45.0 | 22100000. | ——— | NA | ug/kg |
| Strontium | 0 | 0.5 | 216.0 | 250. | 613000.0 | ——— | 48.94 | mg/kg |
| Vanadium | 0 | 0.5 | 98.5 | 100. | 7150.0 | 292 | 45.59 | mg/kg |

| Analyte | Sbd | Sed | Result | RI | Wrw | Er | Bkgd | Units |
|---|---|---|---|---|---|---|---|---|
| AROCLOR-1260 | 0 | 0.5 | 23.0 | 5.1 | 12400.0 | ——— | NA | ug/kg |
| Arsenic | 0 | 0.5 | 13.0 | 25.0 | 22.2 | ——— | 10.09 | mg/kg |
| Barium | 0 | 0.5 | 751.0 | 150. | 26400.0 | ——— | 141.26 | mg/kg |
| BENZO(A)ANTHRACENE | 0 | 0.5 | 91.0 | 42.0 | 34900.0 | ——— | NA | ug/kg |
| Chromium | 0 | 0.5 | 39.3 | 90.0 | 268.0 | ——— | 16.99 | mg/kg |
| CHRYSENE | 0 | 0.5 | 110.0 | 57.0 | 3490000.0 | ——— | NA | ug/kg |
| Copper | 0 | 0.5 | 58.6 | 300. | 40900.0 | ——— | 18.06 | mg/kg |
| FLUORANTHENE | 0 | 0.5 | 190.0 | 89.0 | 27200000. | ——— | NA | ug/kg |
| INDENO(1,2,3-CD)PYRENE | 0 | 0.5 | 72.0 | 51.0 | 34900.0 | ——— | NA | ug/kg |
| Iron | 0 | 0.5 | 41800 | 2500 | 307000.0 | ——— | 18037 | mg/kg |
| Lead | 0 | 0.5 | 59.8 | 20.0 | 1000.0 | 97.7 | 54.62 | mg/kg |
| Manganese | 0 | 0.5 | 540.0 | 200. | 3480.0 | ——— | 365.08 | mg/kg |
| Nickel | 0 | 0.5 | 48.6 | 60.0 | 20400.0 | ——— | 14.91 | mg/kg |
| PYRENE | 0 | 0.5 | 200.0 | 43.0 | 22100000. | ——— | NA | ug/kg |
| Strontium | 0 | 0.5 | 216.0 | 250. | 613000.0 | ——— | 48.94 | mg/kg |
| Vanadium | 0 | 0.5 | 90.0 | 100. | 7150.0 | 292 | 45.59 | mg/kg |
| Zinc | 0 | 0.5 | 141.0 | 50.0 | 307000.0 | ——— | 73.76 | mg/kg |

| Analyte | Sbd | Sed | Result | RI | Wrw | Er | Bkgd | Units |
|---|---|---|---|---|---|---|---|---|
| AROCLOR-1260 | 0 | 0.5 | 10.0 | 4.9 | 12400.0 | ——— | NA | ug/kg |
| Arsenic | 0 | 0.5 | 11.1 | 25.0 | 22.2 | ——— | 10.09 | mg/kg |
| Barium | 0 | 0.5 | 719.0 | 150. | 26400.0 | ——— | 141.26 | mg/kg |
| BENZO(A)ANTHRACENE | 0 | 0.5 | 48.0 | 40.0 | 34900.0 | ——— | NA | ug/kg |
| Chromium | 0 | 0.5 | 43.1 | 90.0 | 268.0 | ——— | 16.99 | mg/kg |
| CHRYSENE | 0 | 0.5 | 62.0 | 55.0 | 3490000.0 | ——— | NA | ug/kg |
| Copper | 0 | 0.5 | 68.3 | 300. | 40900.0 | ——— | 18.06 | mg/kg |
| FLUORANTHENE | 0 | 0.5 | 92.0 | 86.0 | 27200000. | ——— | NA | ug/kg |
| Iron | 0 | 0.5 | 34200 | 2500 | 307000.0 | ——— | 18037 | mg/kg |
| Manganese | 0 | 0.5 | 720.0 | 200. | 3480.0 | ——— | 365.08 | mg/kg |
| Nickel | 0 | 0.5 | 35.5 | 60.0 | 20400.0 | ——— | 14.91 | mg/kg |
| PYRENE | 0 | 0.5 | 94.0 | 41.0 | 22100000. | ——— | NA | ug/kg |
| Strontium | 0 | 0.5 | 241.0 | 250. | 613000.0 | ——— | 48.94 | mg/kg |
| Vanadium | 0 | 0.5 | 86.3 | 100. | 7150.0 | 292 | 45.59 | mg/kg |
| Zinc | 0 | 0.5 | 230.0 | 50.0 | 307000.0 | ——— | 73.76 | mg/kg |

| Analyte | Sbd | Sed | Result | RI | Wrw | Er | Bkgd | Units |
|---|---|---|---|---|---|---|---|---|
| AROCLOR-1260 | 0 | 0.5 | 37.0 | 5.1 | 12400.0 | ——— | NA | ug/kg |
| Barium | 0 | 0.5 | 772.0 | 150. | 26400.0 | ——— | 141.26 | mg/kg |
| BENZO(A)ANTHRACENE | 0 | 0.5 | 85.0 | 41.0 | 34900.0 | ——— | NA | ug/kg |
| Chromium | 0 | 0.5 | 58.2 | 90.0 | 268.0 | ——— | 16.99 | mg/kg |
| CHRYSENE | 0 | 0.5 | 120.0 | 56.0 | 3490000.0 | ——— | NA | ug/kg |
| Copper | 0 | 0.5 | 69.3 | 300. | 40900.0 | ——— | 18.06 | mg/kg |
| FLUORANTHENE | 0 | 0.5 | 210.0 | 88.0 | 27200000. | ——— | NA | ug/kg |
| INDENO(1,2,3-CD)PYRENE | 0 | 0.5 | 71.0 | 51.0 | 34900.0 | ——— | NA | ug/kg |
| Iron | 0 | 0.5 | 32000 | 2500 | 307000.0 | ——— | 18037 | mg/kg |
| Lead | 0 | 0.5 | 61.1 | 20.0 | 1000.0 | 97.7 | 54.62 | mg/kg |
| Manganese | 0 | 0.5 | 640.0 | 200. | 3480.0 | ——— | 365.08 | mg/kg |
| Nickel | 0 | 0.5 | 33.1 | 60.0 | 20400.0 | ——— | 14.91 | mg/kg |
| PYRENE | 0 | 0.5 | 190.0 | 42.0 | 22100000. | ——— | NA | ug/kg |
| Strontium | 0 | 0.5 | 221.0 | 250. | 613000.0 | ——— | 48.94 | mg/kg |
| Vanadium | 0 | 0.5 | 74.8 | 100. | 7150.0 | 292 | 45.59 | mg/kg |
| Zinc | 0 | 0.5 | 193.0 | 50.0 | 307000.0 | ——— | 73.76 | mg/kg |

| Analyte | Sbd | Sed | Result | RI | Wrw | Er | Bkgd | Units |
|---|---|---|---|---|---|---|---|---|
| Acetone | 0 | 0.5 | 6.3 | 100. | 102000000 | 211000 | NA | ug/kg |
| AROCLOR-1260 | 0 | 0.5 | 10.0 | 4.9 | 12400.0 | ——— | NA | ug/kg |
| Barium | 0 | 0.5 | 762.0 | 150. | 26400.0 | ——— | 141.26 | mg/kg |
| Chromium | 0 | 0.5 | 36.0 | 90.0 | 268.0 | ——— | 16.99 | mg/kg |
| Copper | 0 | 0.5 | 73.4 | 300. | 40900.0 | ——— | 18.06 | mg/kg |
| Iron | 0 | 0.5 | 29100 | 2500 | 307000.0 | ——— | 18037 | mg/kg |
| Manganese | 0 | 0.5 | 490.0 | 200. | 3480.0 | ——— | 365.08 | mg/kg |
| Nickel | 0 | 0.5 | 32.5 | 60.0 | 20400.0 | ——— | 14.91 | mg/kg |
| Strontium | 0 | 0.5 | 224.0 | 250. | 613000.0 | ——— | 48.94 | mg/kg |
| Vanadium | 0 | 0.5 | 59.6 | 100. | 7150.0 | 292 | 45.59 | mg/kg |
| Zinc | 0 | 0.5 | 120.0 | 50.0 | 307000.0 | ——— | 73.76 | mg/kg |

# Figure 2
# Surface Soil Sample Results Above Background Levels or MDLs at IHSS Group 500-7

## Key

- Samples Less Than WRW AL
- IHSS
- PAC
- Buildings
- Dirt Roads
- Paved areas
- Surface Water Feature
- Process Waste Lines
- Old Process Waste Lines

RL Detection Limit
BKGD Background
WRW Wildlife Refuge Worker Action Level
ER Ecological Receptor Action Level



N

Scale = 1:500

20 0 20 Feet

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

Prepared by: RADMS

Date: March 2003

KAISER•HILL COMPANY

File: W:\Projects\Fy2003\500-7\500-7_char_jb.apr

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